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CENTER FOR REPRODUCTION OF ENDANGERED SPECIES

REPORT
FALL 1994

1994 Conservation Medalist: A Rain Forest Crusader

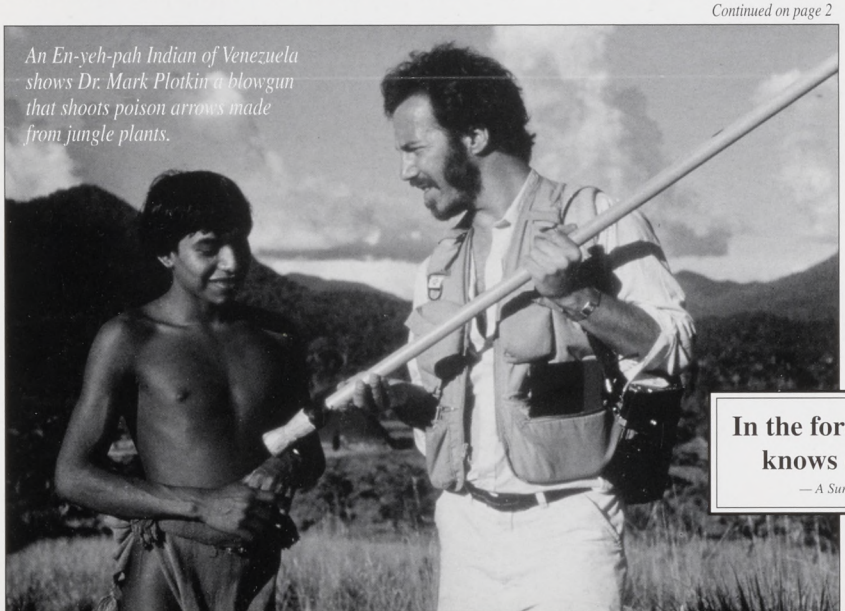
The boy who eagerly collected and studied reptiles in Louisiana in the 1960s and wanted to be an explorer is today a renowned ethnobotanist and a passionate spokesman for the preservation of rain forests—and the Zoological Society of San Diego's 1994 Conservation Medalist. Now, Dr. Mark Plotkin combines adventure with the promotion of conservation.

To the Indians of the Tirió tribe of Suriname he was first named *pananakiri*, the alien, and then became *jako*, or brother. With the Wayana tribe of French Guiana he experienced the healing of an injured arm. And the Yanomamö tribe of the Brazil-Venezuela border initiated him into the use of their hallucinogenic snuff. In the United States, Dr. Mark Plotkin is a senior fellow at Conservation International and consultant to a new biotech firm, Shaman Pharmaceuticals, which focuses research on plants used medicinally by rain forest peoples. He is Harvard educated, Washington, D.C. based, has lived among the Amazonia tribes on and off for the past 15 years, and is one of the most engaging speakers you are ever likely to meet.

Mark Plotkin has styled himself after his Harvard professor and mentor, pioneering ethnobotanist Richard E. Schultes, in whose class he heard the call of the wild. Known as "Old Man Amazon," Professor Schultes made his first trip to the Amazon as a young scientist in 1941 and spent decades studying the plants used by the various tribes. Mark Plotkin was an undergraduate when, in 1978, he was chosen by Dr. Russell Mittermeier to be his assistant on a field trip to the Amazon to study endangered crocodilians. Like Mittermeier—who was the Society's 1988 Conservation Medalist and is now president of Conservation International—Plotkin is a biopolitician, one who is equally good at field research, lobbying efforts, and fund raising.

In Mark Plotkin's crusade to save the rain forests, he argues for the preservation of the tribal culture as well as that of the plant

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An En-yeh-pah Indian of Venezuela shows Dr. Mark Plotkin a blowgun that shoots poison arrows made from jungle plants.

In the forest the Indian knows everything.

— A Surinamese proverb

CRES® is operated by the Zoological Society of San Diego.



Behavior
Hope for the pygmy slow loris population.
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Bonner Fellowship Summer Interns
Behind the scenes at CRES.
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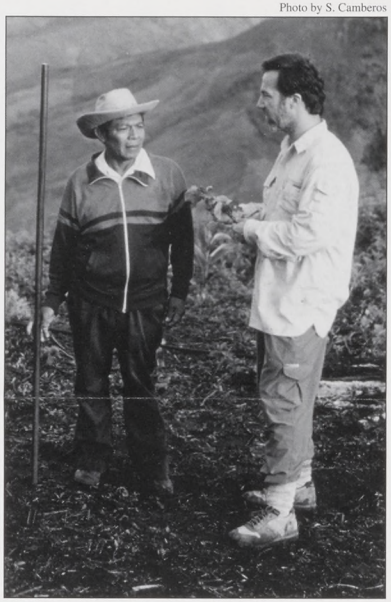
Jurassic Ark
Invitation to a celebration!
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and animal species living there. "We're standing on the edge of a precipice," Plotkin has said. "Thousands and thousands of years of accumulated knowledge of how to use plants in the rain forest is about to disappear." There could be a cure for AIDS, cancers, or fungal infections among the brilliant flowers and glossy leaves of the rain forest. Medical science has already used alkaloids from the rosy periwinkle from Madagascar to treat childhood leukemia and Hodgkin's disease with a high success rate; and curare, once used as a poison to tip arrows, is today used as a muscle relaxant in surgery. But without the indigenous Indians' knowledge of rain forest plants—and their ability to pass on this knowledge to a younger generation—these secrets may never be revealed. This is where the ethnobotanist enters, to study the ways tribes use rain forest plants.

What can modern medicine learn from the witch doctor, or shaman? Mark Plotkin will tell you that "Tropical-forest peoples represent the key to understanding, utilizing, and protecting tropical-plant diversity. As tribal groups disappear, their knowledge vanishes with them. . . . Failure to document this ethnobotanical lore would represent a tremendous economic and scientific loss to mankind." Plotkin also points out that "They have a name for every plant in the forest, and they [the Tirió tribe] use about 300 of them as medicine." He likes to make the analogy that "Talking about plants with these people is like playing basketball with Michael Jordan. They know everything."

Photo by S. Camberos



A Bribri shaman in Costa Rica discusses plant lore with Mark Plotkin.

Through Mark Plotkin's ability to enter into these tribal societies, earning their trust, listening to their shamans and recording their knowledge of plants, he has focused attention on the need to protect the culture as well as the rain forest. Out of this has come his recent book, *Tales of a Shaman's Apprentice*, and the Sorcerer's Apprentice Program created by Conservation International, which has been started in Costa Rica, Colombia, Ecuador, Guyana, Panama, and Suriname.The program's goal is to record traditional ethnobotanical knowledge, protect useful plant species, and pass on this information to the next generation by assigning young men and women as apprentices to tribal shamans.

Mark Plotkin feels the urgency of the moment when he notes that "We have good data on maybe 10 percent of the Amazon plants now. In my lifetime we may get up to, say, 40 percent." But he knows that there are about 250,000 plant species with potentially untapped medical secrets. Indigenous peoples have learned how to harvest useful plants without destroying an entire ecosystem. And developed countries have realized that not all drugs can be synthetically derived. We may lose out on life-saving pharmaceuticals if we destroy the rain forests, and this factor alone may save them.

Mark Plotkin is encouraged by the changing attitudes in public awareness in South America during the last 15 years, with hundreds of environmental groups established. He sees that "The role of institutions like the Zoological Society of San Diego is critical to the success of the conservation movement." Plotkin knows that "If we are to safeguard the rights of the indigenous peoples, protect endangered species, find new foods to feed the hungry, and new medicines to cure the sick, now is the time to act."

–Editor



Barney® Helps a "Special" Cause!

Barney® The Dinosaur visited the San Diego Zoo in June to help raise funds for CRES with six sing-alongs. The Lyons Group, which produces public television's "Barney & Friends™" series, donated $50,000 to CRES from the sales of its home video, "Barney's Alphabet Zoo." Pictured with Barney are Dr. Werner Heuschele (left), director of CRES, and Russell Mack (right), vice president of communications for The Lyons Group.

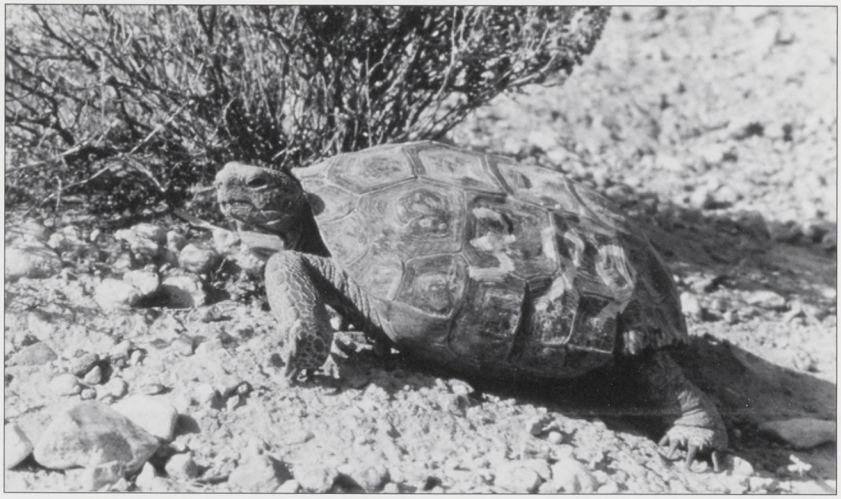


Photo by Allison Alberts

Endocrinology

Ensuring desert tortoise survival is still a major project at CRES. Since studies were initiated in the late 1970s, populations of the desert tortoise in the Mojave Desert are estimated to have declined by as much as 59 percent per year because of habitat destruction and human activity. In 1990, the federal government made an emergency listing of desert tortoise populations as endangered in the area north and west of the Colorado River and as threatened throughout the rest of the Mojave Desert.

At CRES we have been studying the reproductive (hormonal) cycles of a captive population of male and female desert tortoises at the Desert Tortoise Research Center in Las Vegas, Nevada, comparing these animals with wild tortoises in Nevada, Arizona, and California. In addition, we have a group of wild tortoises in Nevada equipped with radiotelemetry equipment that we have followed for one year in order to document growth, reproduction, and any disease problems.

We have also been looking at stress hormones. Our data indicate that captive tortoises undergo similar hormonal cycles to those of the wild tortoises and exhibit normal mating and egg laying, and that there are no indications of elevated stress hormones in captive tortoises. One unusual feature we noted was that levels of testosterone, the male hormone, are tenfold higher than has been found in other turtle species and tenfold higher than in human males.

In September 1994, we started a study of the population of desert tortoises at Fort Irwin, California, in order to determine the sex ratio of immature tortoises and those entering the breeding population, and to study stress hormones and disease in animals in degraded habitats.

The sex of desert tortoises is determined by the temperature at which the eggs are incubated. We have incubated desert tortoise eggs at a range of different temperatures and successfully raised more than 150 hatchlings. However, it is impossible to tell males and females apart until they are sexually mature, which may be anywhere from 10 to 20 years.

Because the chromosomes of male tortoises are identical to those of the females—there are no sex chromosomes—we tested a hormonal method to identify the sex of hatchling tortoises. Female hatchlings have no measurable testosterone, but male hatchlings have relatively high levels of testosterone. The method has been checked on more than 200 tortoises, using a laparoscope, and has proven to be 100 percent accurate. We can now incubate eggs and predict with accuracy the sex ratio of the hatchlings.



Pygmy slow loris babies

Behavior

Once a rare species is brought into captivity, there are great expectations for offspring to be produced. But since pygmy slow lorises were first imported into North American zoos in 1987, the captive population has experienced a steady decline in reproduction. CRES researchers are using a multidisciplined approach to document the reproductive cycle of these rare primates and increase their breeding potential. This is being achieved through careful monitoring of the physiological, behavioral, and hormonal changes associated with reproduction.

Pygmy slow lorises are nocturnal primates, so breeding activities are being recorded through nightly observations, as are social interactions between pairs. This information will be compared with activity patterns noted before the breeding season (conception usually occurs in late summer in this species). Hormonal evaluation of each animal through analysis of fecal samples enables us to detect ovulation and pregnancy. It will also help us document seasonal hormonal variations in both sexes. New estrus-detecting measurements will also be correlated with hormonal and behavioral data to pinpoint a female's most fertile days.

CRES Grants and Donors

Many thanks to ***BIO-RAD Laboratories, Inc****. for donating much needed endocrinology equipment to CRES. The equipment will be used in support of the Society's panda breeding efforts, in conjunction with the Chinese government.*

CRES is grateful to the ***The Bay Foundation*** *for a grant providing vital equipment for a two-year research program on malignant catarrhal fever (MCF), a viral disease that affects many wild and domestic ruminants.*



Photo by Barbara Durrant

The first Bonner Summer Student Interns are Kara Borden (left) and Lisa Morici.

Behind the Scenes at CRES with the Bonner Summer Student Interns

Jewell H. and James T. Bonner recently established the Bonner Summer College Student Fellowship Endowment Fund at CRES. The first two summer interns to benefit from the Fellowship Endowment Fund are Kara Borden, a graduate of the University of California, Davis, and Lisa Morici, a graduate of Mississippi State University. By sponsoring a summer intern, you can join the Bonners and be a part of CRES efforts to improve the health and well-being of vanishing wildlife. For more information, please call Amy Parrott at the San Diego Zoo at (619) 685-3213.

I was recently asked that familiar question, "What did you do on your summer vacation?" This person could never have guessed that this summer I worked with Dr. Barbara Durrant in the reproductive physiology laboratory at CRES. Research in this lab focuses on gamete (sperm and ova) collection, evaluation, and preservation.

Collection and preservation of gametes for future reproduction is an efficient way to manage captive-breeding programs. Preserved gametes can be combined with those of individuals from other populations, without stressful shipment of animals. We routinely obtain sperm for fertilization studies, but ova collection and preservation methods need further research.

The project I worked on concentrated on the recovery of immature ova from the ovaries of females. Using the domestic dog as a model for endangered carnivores, we collected ovaries following routine spay by local veterinarians. The first problem to be solved was digestion of ovarian tissue to release the ova. Freed ova were then painstakingly prepared for microscopic characterization of their developmental stage, a process requiring visualization of specific internal structures. Dog ova, like many carnivore ova, are surrounded by densely packed "nurse cells" and are full of darkly pigmented fats that make characterization impossible. It took several weeks to develop techniques to remove nurse cells and clear fats without damaging the other structures within the ovum. We are now preparing for the next phase of the study—*in vitro* growth and maturation of carnivore ova.

—Kara Borden

As a summer intern at CRES, I was fortunate to go "behind the scenes" at the San Diego Zoo. Working under the direction of Dr. Valentine Lance, I was introduced to some of the advanced techniques in hormonal research.

Using modern radioimmunoassay, endocrinologists at CRES can detect even the smallest amounts of hormones in the blood plasma, urine, and feces of wild or captive animals. This reduces the need for invasive techniques. Instead, we can predict the animal's reproductive status by measuring the amounts of circulating testosterone, estradiol, and progesterone.

Even more exciting is the recent discovery by Dr. Lance that testosterone levels in hatchlings and immature animals of many species can be used to predict their sex. For example, male and female green sea turtles look identical until 20 years of age. By collecting only a small sample of blood, Dr. Lance has been able to identify the sex of this animal with 100 percent accuracy!

My main focus was on the reproductive cycle of the endangered desert tortoise in the Mojave Desert. Thus far, we have examined its annual reproductive cycle for two full years by analyzing the levels and seasonal changes of testosterone, estradiol, and progesterone. We compared our findings for a captive population with those in the wild and found them to be similar. The tortoises display seasonal fluctuations of testosterone and estradiol levels, and their peak mating period can be predicted. Should captive breeding become necessary, knowledge of the reproductive behavior and hormonal influences will be invaluable.

It is reassuring to know that so many people care about the plight of a species. If such efforts continue, there is no doubt in my mind that the desert tortoise will be around for many years to come.

—Lisa Morici

San Diego Zoo presents

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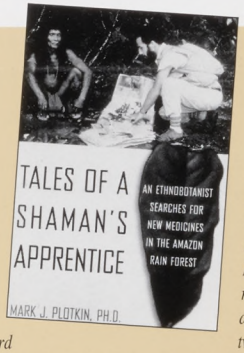
Proceeds benefit the Zoological Society of San Diego's Center for Reproduction of Endangered Species (CRES).
CRES is the Zoological Society's conservation and research center, which is helping to save numerous endangered animal species.

Tickets will be held at the door in the name of the purchaser.

An Evening with the Conservation Medalist

The Zoological Society of San Diego's Conservation Medal for this year will be presented to Dr. Mark Plotkin on Friday, October 7. Dr. Plotkin is being honored for his extensive work in finding medicinal uses for rain forest plants and creating sustainable use industries. These projects will, in turn, benefit native peoples and preserve rain forest habitats.

The dinner, hosted by the Zoological Society and its board of trustees, will be held at the Sheraton Harbor Island Resort. Animal friends will be on hand and complimentary cocktails will be served at 6:30 P.M. in the resort's bayside cafe, followed by a gourmet dinner at 7:30 P.M. in the Harbor Island One Room. The program will include recognition of CRES benefactors and a slide presentation by Dr. Plotkin of his experiences as a "shaman's apprentice." Tickets are available for $60 per person or tables of 8 for $400. Call (619)557-3974 for more information.



The Single Best Speaker in the Conservation Business

Come on an adventure into the rain forest with Dr. Mark Plotkin—"He is the single best speaker in the conservation business, period," Russ Mittermeier declares—as he relates his experiences searching the Amazon jungles for plant cures. His stories of Amazon shamans, who put him through tests and rituals to prove him worthy of sharing their healing secrets, and his slides of life in the jungle are captivating. There will be two presentations on Saturday, October 8—one at 6:30 P.M. and one at 8 P.M.—in the Otto Center auditorium at the Zoo. The fee is $9 for Society members and $11 for nonmembers, ages 10 and up only. Autographed copies of Dr. Plotkin's book, Tales of a Shaman's Apprentice, *will be available for purchase. Reservations are required—his last presentation sold out quickly and there was a long waiting list! Send a check payable to the San Diego Zoo to: Plotkin, San Diego Zoo, P.O. Box 551, San Diego, CA 92112-0551. For more information, call (619)557-3963.*

Can Collection for CRES Makes Good "Cents"

Does the thought of sticky aluminum cans piled up in the corner of your garage sound appealing to you? Well, to hundreds of students, parents, teachers, and organizations, the idea is an exciting one! For 14 years, dedicated community members have been saving, counting, crushing, and redeeming aluminum cans for the Cans for Critters recycling program, with the proceeds designated to benefit CRES. Schools, families, and organizations know that every can counts, and they have combined their efforts to increase can collections. Adam Jacobs from Del Mar Heights School piled them high with an incredible 5,790 cans for the spring drive!

But there's more to it than just "can craziness." The program also includes prizes, special visits from San Diego Zoo animal pals, and a fun-filled party at the end of each drive. Can collecting for CRES makes good "cents," and, whether the contribution is large or small, every participant learns that they can help to make an important difference in the future of our endangered wildlife through the research efforts at CRES.

If you would like to know more about the Cans for Critters program, please call Kim Jordan at the Zoo's development office at (619)557-3974. But hurry! The fall drive begins September 26 and ends November 4, 1994.



CRES REPORT
CENTER FOR REPRODUCTION OF ENDANGERED SPECIES

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SAN DIEGO ZOO
SAN DIEGO WILD ANIMAL PARK

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